

Health Consequences of Uninsurance among Adults in the United States: Recent Evidence and Implications

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Context: Uninsured adults have less access to recommended care, receive poorer quality of care, and experience worse health outcomes than insured adults do. The potential health benefits of expanding insurance coverage for these adults may provide a strong rationale for reform. However, evidence of the adverse health effects of uninsurance has been largely based on observational studies with designs that do not support causal conclusions. Although recent research using more rigorous methods may offer a better understanding of this important subject, it has not been comprehensively reviewed.

Methods: The clinical and economic literature since 2002 was systematically searched. New research contributions were reviewed and evaluated based on their methodological strength. Because the effectiveness of medical care varies considerably by clinical risk and across conditions, the consistency of study findings with clinical expectations was considered in their interpretation. Updated conclusions were formulated from the current body of research.

Findings: The quality of research has improved significantly, as investigators have employed quasi-experimental designs with increasing frequency to address limitations of earlier research. Recent studies have found consistently positive and often significant effects of health insurance coverage on health across a range of outcomes. In particular, significant benefits of coverage have now been robustly demonstrated for adults with acute or chronic conditions for which there are effective treatments.

Conclusions: Based on the evidence to date, the health consequences of uninsurance are real, vary in magnitude in a clinically consistent manner, strengthen

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the argument for universal coverage in the United States, and underscore the importance of evidence-based determinations in providing health care to a diverse population of adults.

Keywords: Medically uninsured, outcome assessment, healthcare disparities, chronic disease.

IN ITS COMPREHENSIVE STUDY OF THE HEALTH CONSEQUENCES OF uninsurance, *Care without Coverage: Too Little, Too Late*, the Institute of Medicine in 2002 found that uninsured adults in the United States have less access to recommended care, receive poorer quality of care, and experience worse health outcomes than insured adults do (IOM 2002). Derived from a systematic review of a large body of research, these findings led to the conclusion that providing health insurance coverage to uninsured adults would likely improve their health status and reduce their risk of premature death. Since this report was published, the number of Americans who lack health insurance rose to 46 million in 2007, including 37 million, or 19.6 percent, of the nonelderly adult population (DeNavas-Walt, Proctor, and Smith 2008). If health insurance coverage indeed improves health, then the benefits of policies to expand coverage could be substantial.

The Institute of Medicine's findings were distilled from consistent evidence provided by more than 130 research articles and substantiated by a subsequent rigorous literature review (Hadley 2003). These conclusions could not be stated with great certainty, however, because they were based largely on observational studies that had fundamental design limitations. Most of these studies compared health-related outcomes of insured and uninsured adults and used statistical techniques to adjust for other predictors of health that may be related to health insurance status.

Such comparisons are problematic for two principal reasons. First, insured and uninsured adults may differ greatly in their sociodemographic characteristics, environmental influences, clinical risk factors, health behaviors, preferences, or other predictors of health. It is virtually impossible to measure all systematic differences among these groups, some of which may be unobservable, let alone measure them all precisely. Moreover, comparisons of insured and uninsured adults often rely

on data collected on a limited set of variables. Therefore, important differences may remain after statistical adjustments that explain observed differences in health between insured and uninsured adults. Econometricians commonly call this threat to validity the *omitted variables bias*; epidemiologists label it *unmeasured confounding*.

Second, health insurance status not only may affect health, but health also may affect health insurance status. For example, health declines may lead to coverage gains through increased demand for private insurance or eligibility for public insurance, or they may lead to uninsurance through job loss, income reductions, or selection behaviors by insurers. Therefore, cross-sectional associations between health insurance status and health may be due to the effects of health on health insurance, rather than the reverse. Longitudinal data would allow for prospective comparisons of outcomes among insured and uninsured adults, but adjusting for baseline health differences that may be either the cause or the result of coverage differences could bias estimates to unpredictable degrees.

Conclusions about the health consequences of uninsurance would ideally rely more heavily on experimental or quasi-experimental evidence (Levy and Meltzer 2008). The RAND Health Insurance Experiment remains the only study in which features of coverage were randomly assigned, however, and ethical and practical considerations make future trials of its kind unlikely. This large-scale social experiment found that less cost-sharing by patients increased the utilization of both appropriate and inappropriate care, with no health benefits on average (Newhouse 1993). But these overall findings may not generalize to the current population of uninsured adults in the United States, for several reasons. The RAND study lacked a strictly uninsured group, as even subjects assigned 95 percent cost-sharing had a stop-loss provision in their coverage. Furthermore, subjects that did benefit from more extensive coverage, such as low-income adults with hypertension, more closely resembled adults who tend to be uninsured. Finally, advances in medical technology and the delivery system over the past three decades may have improved the net effectiveness of health care. In particular, many uninsured adults have chronic conditions (Wilper et al. 2008) for which there now are many beneficial therapies.

In the absence of further experimental evidence, the use of other rigorous methodological approaches to extract valid causal conclusions from observational data has become essential (Brown, Bindman, and Lurie 1998; Levy and Meltzer 2004). These so-called quasi-experimental

designs attempt to address the endogeneity of health insurance and health (i.e., bias from unmeasured confounding or reverse causality) by assessing the effects of coverage changes or coverage differences that are plausibly exogenous, or unrelated to health and to all observed or unobserved predictors of both coverage and health. That is, these approaches try to recover randomized experiments from observational data. Such exogenous variation may be caused by policies that expand or contract eligibility for public insurance programs or may be identified by a cleverly selected instrumental variable that, like random treatment assignment, is related to health only through its effect on insurance status. Empirical approaches commonly employed in quasi-experimental analyses include difference-in-differences, interrupted time series, regression discontinuity, and instrumental variables methods. Many of these quasi-experimental approaches have a common identification strategy that uses differences in health among groups, or trends in health, before coverage changes to predict subsequent differences or trends in outcomes that would be expected with no changes in coverage. Assuming that other predictors of health do not also change among comparison groups, differences between observed and expected outcomes can be attributed to the effects of coverage.

Of the 131 studies reviewed in *Care without Coverage* (IOM 2002), only three (Fihn and Wicher 1988; Goldman et al. 2001; Lurie et al. 1984) were characterized by a subsequent review as quasi-experimental (Levy and Meltzer 2004). These three studies provided strong evidence of the beneficial effects of health insurance coverage on blood pressure control among adults with hypertension and on mortality among adults with HIV. Because of the paucity of quasi-experimental evidence, however, conclusions about the effects of coverage on health outcomes in other subgroups or in the general population could not be made with similar confidence.

Therefore, it is important to consider what has been learned since 2002. How has the quality of research evolved? Does the current body of evidence support broader or more certain conclusions about the effects of health insurance coverage on health? To answer these questions, I reviewed new research studies, evaluated their methodological strength, assessed the significance of their contributions, and posited conclusions they support. Because none of these recent studies were randomized trials, they all are technically observational. Nevertheless, to distinguish stronger from weaker evidence, it is useful to classify these studies as

“observational” or “quasi-experimental” based on their designs. While findings from quasi-experimental studies should be given the greatest weight when formulating conclusions, the results of observational studies should not be ignored. Because the results of quasi-experimental studies often cannot be generalized beyond the local or marginal groups affected by specific policies, observational studies may support inferences about larger populations, particularly when observational and quasi-experimental analyses of similar outcomes produce consistent findings. In addition, observational analyses of sufficiently detailed data allow causal pathways to be explored, paving the way for more definitive work. For example, clinical measures of disease control may be assessed as potential mediators of observed associations between coverage and more distal outcomes, or longitudinal data may be used to determine whether health declines occur before or after the loss of insurance coverage. Observational comparisons do not support causal inference, but sensitivity analyses can be used to characterize the robustness of associations. Moreover, for certain outcomes or populations, strong quasi-experimental designs may not be feasible, leaving observational studies, with their limitations, as policymakers’ sole source of information.

Because the health effects of health insurance presumably are mediated through health services, these effects should not be expected to be any less heterogeneous across demographic subgroups and clinical conditions than are the benefits of medical care. That is, if more health care is better for some patients than others, then the benefits of health insurance should vary accordingly. Therefore, the clinical appropriateness of research questions also should be considered when evaluating these studies. For example, an indiscriminate conclusion that coverage does not affect health would not be substantiated by a study limited to subjects with a condition for which few effective treatments are available or to outcomes that are incommensurate with clinical expectations.

The body of research on health insurance and HIV care and outcomes exemplifies the importance of the preceding methodological and clinical considerations. The outcomes of adults with HIV infection are exquisitely sensitive to the receipt of appropriate care, as there have been important advances in diagnosing, preventing, and treating opportunistic infections and preserving immunocompetence with antiretroviral therapy. Several observational studies have demonstrated that uninsured adults with HIV are less likely to receive regular care and drug treatment (IOM 2002), suggesting substantial negative effects of uninsurance

on health outcomes in this population. In contrast, similarly designed comparisons of mortality have suggested that health insurance coverage significantly increases the risk of death for patients with HIV (Goldman et al. 2001). Likely driving this perverse association were unobserved differences in health between uninsured adults and adults who became eligible for Medicaid or Medicare after experiencing disabilities related to advanced disease.

Using measures of state Medicaid eligibility restrictions and generosity of coverage as instrumental variables, Goldman and colleagues (2001) conducted a quasi-experimental analysis of longitudinal data that robustly demonstrated that health insurance substantially reduced the risk of death within six months for adults with HIV. These estimates applied only to the marginal group of patients whose insurance status was determined by state policies, but their consistency with observational findings for access to care and receipt of therapies suggests that the health benefits of coverage generalize more broadly to HIV patients who would be uninsured regardless of their state of residence. Thus, as this body of research matured, the use of quasi-experimental methods was crucial to addressing limitations of prior observational research and drawing valid conclusions about the importance of insurance coverage for this care-sensitive population, while its largely observational base guided research questions and provided grounds for generalization.

My objective in this article is to summarize and evaluate new research contributions since 2002 and draw updated conclusions about the health consequences of uninsurance among U.S. adults. My review proceeds as follows: First I describe the methodologies used for searching the literature, selecting studies, and evaluating their quality. Then I present the findings, strengths, and limitations of the reviewed studies. Finally, I discuss what has been learned from these new contributions, directions for future work, and policy implications of the current body of research.

Review Methodology

Literature Search

In August 2008, I conducted systematic searches of the National Library of Medicine's PubMed and the American Economic Association's EconLit databases to identify potentially relevant studies that had been published or been made publicly available as working papers after November 2001,

when the Institute of Medicine concluded its literature search (IOM 2002). I limited my search to studies of adults aged nineteen or older and used the following three Medical Subject Heading Terms from the National Library of Medicine's controlled vocabulary for the PubMed search: *medically uninsured*, *medical indigency*, and *uncompensated care*. As in an earlier review of this literature (Hadley 2003), I used *health insurance* and *payer source* as keywords in searches of the EconLit database in combination with terms for outcome measures (*preventive health services*, *health status*, *health outcomes*, and *mortality*) or specific conditions (*hypertension*, *heart disease*, *diabetes*, *stroke*, *cancer*, *HIV*, and *depression*). These searches generated 755 and 192 citations, respectively. I then screened these citations, as well as those from selected author searches and bibliographies of recent reviews (Freeman et al. 2008; Levy and Meltzer 2004, 2008).

Inclusion Criteria

To focus on the effects of health insurance coverage on health, I gave priority to studies that examined health outcomes. I broadly defined the set of dependent variables regarded as health outcomes to include administrative, survey, or clinical assessments of general, physical, or mental health, disease control or severity, or mortality. Also included were health services strongly suggestive of outcomes by virtue of clinical evidence or utilization patterns before and after changes in insurance coverage.

I included observational studies only if they compared insured and uninsured subjects and investigated the sensitivity of results to statistical adjustments for observed demographic and socioeconomic characteristics. These features were not required of quasi-experimental studies, which by design can control for both observed and unobserved differences among comparison groups to more plausibly identify causal effects, even when comparing groups by sociodemographic predictors of coverage rather than insured and uninsured adults directly. I excluded quasi-experimental studies, however, if the strategy to identify causal effects required assumptions that were not plausible.

A key requisite for selection was the demonstration of a distinct contribution to the research on the consequences of uninsurance conducted before 2002. I assessed contributions in each of the following dimensions: (1) the strength of the study design and its methodological rigor (e.g., quasi-experimental versus observational design, inclusion of sensitivity

analyses, handling of missing data); (2) the quality of the data (e.g., longitudinal versus cross-sectional, level of clinical detail, unique linkages); (3) the importance of outcomes (e.g., validated measures of health versus processes of care); and (4) the external validity of results (e.g., findings generalizable to broader populations or previously unstudied diseases).

Although it is an important related topic, I did not consider the extensiveness of coverage (i.e., services covered and cost sharing) and related effects on health among the insured. Instead, I used interchangeably the terms *health insurance status* and *health insurance coverage*, and variations of these, to refer strictly to “insured” or “uninsured” adults who did or did not have insurance coverage for basic medical and hospital care, consistent with conventional definitions used in the studies I reviewed. Finally, I excluded analyses of international data unless U.S. adults were used as a comparison group.

After applying these inclusion criteria to the studies identified in literature searches, I selected forty-two studies for systematic review (these studies, listed in the references, are marked by an asterisk).

Evaluation of Evidence

The primary basis for evaluating the selected studies was methodological strength. Thus, I gave the greatest weight to quasi-experimental analyses that could identify causal effects of health insurance coverage on health under reasonable assumptions. In making this determination, I took into account important limitations of various quasi-experimental designs. I then used the clinical importance of the outcome(s) examined to rank the studies within categories of methodological rigor, giving greater weight to assessments using validated measures of health status. Finally, in further elaborating the relative significance of each study, I looked at research contributions in other dimensions. Based on this qualitative evaluation of recent research and findings from reviews of earlier research (Hadley 2003; IOM 2002; Levy and Meltzer 2004), I summarized our current knowledge of the impact of health insurance on health.

Presentation of Findings

The key findings from the forty-two studies are presented by study outcome, broadly classified as health services or health outcomes, with health outcomes further categorized by relevant clinical conditions

or populations. I found no new studies of health insurance and HIV outcomes that added significantly to the already strong body of research on this topic. For each category of outcomes, I briefly summarize the findings from the Institute of Medicine's 2002 report and then discuss the findings, strengths, and limitations of more recent observational and quasi-experimental studies. As Hadley did in his 2003 review of the literature through 2001, I constructed two tables of my findings. Table 1 lists the studies that I reviewed according to their methodological rigor (observational versus quasi-experimental), type of outcome (health services versus health outcomes), and the direction and statistical significance of estimated effects. Table 2 highlights the quasi-experimental studies focusing on health outcomes, with brief descriptions of their data source and quality, methodological approach, main findings, and limitations.

Review Findings: Health Services

Preventive Services

Observational studies before 2002 consistently demonstrated strong associations between health insurance coverage and the receipt of important screening and preventive services for both men and women (IOM 2002). Carrasquillo and Pati (2004) extended this observational evidence to immigrant women in the United States and found smaller disparities in Pap testing and mammography between immigrant and nonimmigrant women who had health insurance or a regular source of care. Several earlier studies also explored certain interactions and found that deficits in preventive care were greatest for uninsured adults who were racial or ethnic minorities or had low incomes, less extensive coverage, or longer periods of uninsurance (IOM 2002). Using longitudinal survey data with greater detail on continuity of coverage, Sudano and Baker (2003) found that rates of mammography, Pap testing, cholesterol testing, and influenza vaccination decreased in a stepwise fashion with an increasing number of episodes of uninsurance over a four-year period. For example, rates of mammography were 76.7 percent, 62.0 percent, 53.4 percent, and 34.7 percent for women who reported zero, one, two, and three periods without insurance. Rates of self-breast examination, a practice arguably less sensitive to insurance status but reflective of

TABLE 1
New Contributions by Health Outcomes, Findings, and Methodological Rigor

	Association between Health Insurance Status and Outcome			
	Positive and Statistically Significant ^a		Not Statistically Significant ^a	
	Observational	Quasi-Experimental	Observational	Quasi-Experimental
<i>Health services</i>				
Preventive	2	5	1	1
General	0	4	0	0
Total	2	9	1	1
<i>Health outcomes</i>				
General health outcomes				
General health and physical functioning	3	6	0	2
Mortality	2	2	0	2
Chronic conditions				
Cardiovascular disease and diabetes	4	1	0	0
Cancer	6	0	1	2
Depression	0	1	0	0
Acute conditions	2	3	1	1
Total	17	13	2	7

Notes: The forty-two studies reviewed are marked with asterisks in the references. Cell frequencies sum to more than the forty-two studies because several studies assessed more than one outcome or reported both significant and nonsignificant findings in separate analyses.

^aStatistical significance defined as $p < 0.05$.

TABLE 2
Recent Quasi-Experimental Studies of the Effects of Health Insurance Coverage on Health Outcomes

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
Card, Dobkin, and Maestas 2004; The Impact of Nearly Universal Insurance Coverage on Health Care Utilization and Health: Evidence from Medicare.	Cross-sectional survey data from the 1992–2001 NHIS; mortality data from NCHS Multiple Cause of Death files.	Regression discontinuity analysis of general health status by age.	Medicare eligibility after age 65 associated with significant 12% relative reduction in sociodemographic disparity in general health status but no evidence of deceleration in mortality rates at age 65.	Comparisons by prior insurance status or preexisting conditions not possible with cross-sectional data; only one self-reported general health outcome assessed; differential changes in health trends not assessed; regression discontinuity design not suited to identifying delayed mortality effects in general population.

Continued

TABLE 2—Continued

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
Card, Dobkin, and Maestas 2007; Does Medicare Save Lives?	Cross-sectional state hospital discharge data from California from 1992 to 2002.	Regression discontinuity analysis of mortality by age among acutely ill adults hospitalized for nondeferrable conditions.	Medicare eligibility after age 65 associated with abrupt absolute decrease in seven-day mortality of 1% (20% relative reduction) that persisted for at least two years after admission.	Comparisons by prior insurance status not possible with cross-sectional data; alternative explanations for survival gains could not be tested directly.
Decker and Rapaport 2002; Medicare and Inequalities in Health Outcomes: The Case of Breast Cancer.	SEER cancer registry data from 1980 to 1994 with follow-up mortality data.	Difference-in-differences comparisons of stage of diagnosis and survival for white and black women with breast cancer before and after age 65.	Medicare eligibility after age 65 associated with significant decrease in probability of late detection for white women but not black women; coverage estimated to increase five-year survival rate for both black and white women diagnosed with early-stage disease, but differential effect for black women not significant.	Comparisons by prior insurance status not possible; persistent racial and ethnic disparities in outcomes among insured adults may have reduced differential effects; outcomes assessed for breast cancer only.

Decker 2005; Medicare and the Health of Women with Breast Cancer.	SEER cancer registry data from 1980 to 2001 with follow-up mortality data.	Difference-in-differences comparisons of stage of diagnosis and survival for white, black, and Hispanic women with breast cancer before and after age 65.	Medicare eligibility after age 65 associated with absolute decrease of 3.4% in probability of late detection for Hispanic women and 1.8% decrease for white women, but differential effect not significant; 11% relative reduction in mortality risk after age 65 did not differ by race or ethnicity.	Comparisons by prior insurance status not possible; persistent racial and ethnic disparities in outcomes among insured adults may have reduced differential effects; outcomes assessed for breast cancer only.
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TABLE 2—Continued

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
Decker and Remler 2004; How Much Might Universal Health Insurance Reduce Socioeconomic Disparities in Health? A Comparison of the US and Canada.	Cross-sectional survey data from the 1997–1998 NHIS and the 1996–1997 NPHS.	Difference-in-differences-in-differences comparison of general health status by age in the U.S. and Canada.	Medicare eligibility after age 65 associated with a significant differential reduction of 4.0 percentage points in probability of fair or poor health for low-income U.S. adults; socioeconomic disparity in general health among nonelderly adults reduced by more than half.	Comparisons by prior insurance status or preexisting conditions not possible with cross-sectional data; only one self-reported general health outcome assessed; differential changes in health trends not assessed; precise age at which discontinuity occurred could not be assessed; fluctuating disparities in health within countries suggest explanations other than Medicare coverage.

Dor, Sudano, and Baker 2006; The Effect of Private Insurance on the Health of Older, Working Age Adults: Evidence from the Health and Retirement Study.	Longitudinal survey data from the 1992–1998 HRS.	Instrumental variables analysis using state-level marginal tax rates, unemployment rates, and unionization rates as instruments for health insurance coverage.	Having private insurance at baseline associated with significantly better health scores for a summary index of five general and physical health measures.	Validity of instruments cannot be tested directly; self-reported health outcomes; continuity of coverage not assessed.
Finkelstein and McKnight 2005; What Did Medicare Do (and Was It Worth It)?	Mortality data from NCHS Multiple Causes of Death files.	Difference-in-differences comparisons of mortality before and after 1965 by age (young elderly who became covered by Medicare in 1965 versus near-elderly who did not) and by geographic variation in insurance rates before 1965.	No discernable impact of the introduction of Medicare in 1965 on overall mortality for elderly adults.	Coverage gains occurred more than 40 years ago; subsequent medical advances likely to have improved the effectiveness of health care.

Continued

TABLE 2—Continued

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
Hadley and Waidmann 2006; Health Insurance and Health at Age 65: Implications for Medical Care Spending on New Medicare Beneficiaries.	Longitudinal survey data from the 1992–1998 HRS.	Instrumental variables analysis using spouse's prior union status, immigrant status and years in the U.S., and involuntary job loss as instruments for health insurance coverage.	Continuous insurance coverage associated with significantly fewer deaths among the near-elderly before age 65 (2.8% absolute decrease in death rate) and significant upward shift in distribution of general health states among those who survived (3.3% and 4.1% absolute increases in probability of excellent and very good health, respectively).	Validity of instruments cannot be tested directly; self-reported health outcomes.

Lichtenberg 2002; The Effects of Medicare on Health Care Utilization and Outcomes.	Cross-sectional survey data from the 1987–1991 NHIS; vital status data from SSA life tables.	Regression discontinuity analyses of disability and mortality by age.	13% relative reduction in bed days and 5.1% absolute decrease in ten-year mortality risk associated with Medicare eligibility after age 65.	Effects not disaggregated by predictors of insurance status; comparisons by prior insurance status not possible with cross-sectional data; potentially spurious results due to data limitations of SSA life tables; formal testing of effects not consistently conducted; alternative explanations not addressed.
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TABLE 2—Continued

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
McWilliams et al. 2007a; Health of Previously Uninsured Adults after Acquiring Medicare Coverage.	Longitudinal survey data from the 1992–2004 HRS.	Comparison of health trend changes at age 65 by prior insurance status.	Medicare eligibility after age 65 associated with differentially improved health trends for previously uninsured with cardiovascular disease or diabetes in summary health ($p = .006$), change in general health ($p = .03$), mobility ($p = .05$), agility ($p = .003$), and adverse cardiovascular outcomes ($p = .02$); differential improvement also significant for depressive symptoms ($p = .002$) but not summary health ($p = .17$) for previously uninsured without these conditions.	Self-reported health outcomes; subject to bias from differential mortality among previously uninsured or coincidental changes in time-varying predictors of health among comparison groups.

Pauly 2005; Effects of Insurance Coverage on Use of Care and Health Outcomes for Nonpoor Young Women.	Cross-sectional survey data from the 1996 MEPS.	Instrumental variables analysis using firm size and marital status as instruments for health insurance status.	Associations between insurance coverage and probability of fair or poor health not significant in either naïve or instrumental variables analyses.	Validity of instruments cannot be tested directly; imprecise estimates; only one self-reported general health outcome assessed.
Polsky et al. 2006; The Health Effects of Medicare for the Near-Elderly Uninsured.	Longitudinal survey data from the 1992–2004 HRS.	Comparison of health trend changes at age 65 by prior insurance status.	Medicare eligibility after age 65 associated with significant improvements in health trajectories for both previously insured and previously uninsured adults; differential increase in probability of being in excellent or very good health after age 65 not significant for previously uninsured adults (absolute increase +1.8%; 95% CI: –2.6, 7.0).	Only one self-reported general health outcome assessed; subject to bias from differential mortality among previously uninsured or coincidental changes in time-varying predictors of health among comparison groups.

Continued

TABLE 2—*Continued*

Study	Data ^a	Methodological Approach	Principal Findings ^b	Limitations
Volpp et al. 2003; Market Reform in New Jersey and the Effect on Mortality from Acute Myocardial Infarction.	Cross-sectional state and national hospital discharge data from New Jersey, New York, and the NIS from 1990 to 1996.	Difference-in-differences comparisons of mortality rates for hospitalized patients with acute myocardial infarction in New Jersey and New York before and after state reforms in New Jersey reduced subsidies for hospital care for the uninsured and introduced price competition.	New Jersey health care reform associated with no significant changes in mortality for insured patients in New Jersey relative to New York or the nation, but with a significant differential increase of 3.7 to 5.2 percentage points in mortality rates for uninsured patients in New Jersey.	Subject to bias from coincidental changes in state-specific predictors of mortality in insured and uninsured populations; mortality for only one condition assessed; analysis limited to one state and may not generalize to national population of uninsured.

Volpp et al. 2005; The Effects of Price Competition and Reduced Subsidies for Uncompensated Care on Hospital Mortality.	Cross-sectional state hospital discharge data from New Jersey and New York from 1990 to 1996.	Difference-in-differences comparisons of mortality rates for hospitalized patients with six other acute conditions in New Jersey and New York before and after state reforms in New Jersey reduced subsidies for hospital care for the uninsured and introduced price competition.	New Jersey health care reform associated with relative increases in mortality for uninsured New Jersey patients with congestive heart failure ($p < .05$) and stroke ($p > .05$) compared with uninsured New York patients; mortality trends similar in New Jersey and New York for patients with other conditions, regardless of insurance status.	Subject to bias from coincidental changes in state-specific predictors of mortality in insured and uninsured populations; analysis limited to one state and may not generalize to national population of uninsured.
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Notes.^a Abbreviations of data sources: HRS (Health and Retirement Study), MEPS (Medical Expenditure Panel Survey), NCHS (National Center for Health Statistics), NHIS (National Health Interview Survey), NIS (Nationwide Inpatient Sample), NPHS (National Population Health Survey), SEER (Surveillance, Epidemiology, and End Results), SSA (Social Security Administration).

^b Point estimates, 95% confidence intervals (CI), or *p*-values presented as reported in original articles.

healthy behaviors, did not vary by continuity of coverage. Although these findings suggest dose-response effects of coverage and affordability on the use of recommended clinical services, unobserved predictors of health care utilization also may have varied by continuity of coverage and sociodemographic factors, which would explain these associations. Furthermore, a recent observational study that assessed quality of care from the medical records of 6,712 adults living in twelve communities found that the receipt of recommended preventive, chronic, and acute care differed little by insurance status (Asch et al. 2006). But records were obtained for only 37 percent of the eligible sample, and the resulting fraction who were uninsured was low (7.8 percent). Therefore, these estimates may not have been representative of the national uninsured population, particularly for the disease-specific measures of quality assessed in subsamples.

Four quasi-experimental studies since 2002 more robustly estimated the effects of health insurance coverage on the use of preventive services. Card, Dobkin, and Maestas (2004) used a regression discontinuity framework to determine changes in the provision of preventive care associated with Medicare eligibility at age sixty-five. In this context, this technique uses age trends before age sixty-five to predict utilization after this age and attributes any abrupt deviations from predicted trends occurring at age sixty-five to Medicare coverage. These researchers constructed age profiles from the 1998–2002 Behavioral Risk Factor Surveillance System (BRFSS) and 1997–2001 National Health Interview Survey (NHIS) data. They discovered several significant increases, ranging from five to ten percentage points in rates of influenza vaccination, cholesterol testing, mammography, and diagnosed hypertension, at age sixty-five for some groups of adults who were more likely to be uninsured before this age based on their race, ethnicity, and educational attainment. These increases were not consistently greater for all these sociodemographic groups across all preventive services, and the estimates were too imprecise to evaluate smaller effects of Medicare coverage on utilization. In a similarly designed regression discontinuity analysis of a larger sample of more than 250,000 women participating in the 1991 to 2001 BRFSS surveys, Decker (2005) estimated rates of mammography more precisely and found increases at age sixty-five to vary significantly and more consistently across race, ethnicity, and educational attainment. For example, the percentage of college-educated women reporting a mammogram in the preceding two years rose by 1.4 percentage points after

age sixty-five, a nonsignificant finding, whereas significant increases of 2.6 and 4.8 percentage points were observed among women with high school degrees and less than a high school education, respectively. Similarly, rates of mammography rose by 2.4 percentage points among white women, 4.4 percentage points among black women, and 7.5 percentage points among Hispanic women, consistent with the graded prevalence of uninsurance before age sixty-five across these racial and ethnic groups. In tests of differential effects, increases were significantly greater for less educated and minority women.

Because these two studies relied on cross-sectional data, groups could not be compared by insurance status before age sixty-five. McWilliams and colleagues (2003) used longitudinal data from the Health and Retirement Study (HRS) to assess the receipt of basic clinical services before and after Medicare eligibility at age sixty-five for adults who were continuously uninsured, intermittently uninsured, or continuously insured before their eligibility. Despite small samples of uninsured adults, differences in the use of cholesterol testing and mammography between continuously insured and continuously uninsured adults fell significantly after age sixty-five, by 17.7 and 15.3 percentage points, respectively. This difference-in-difference comparison attempted to eliminate any fixed differences in observed or unobserved characteristics among insured and uninsured adults before age sixty-five in order to isolate changes in service use after this age that could be attributed to gains in insurance coverage. The differential effects of gaining coverage on service use were positive but smaller for intermittently uninsured adults, and increases in cholesterol testing after age sixty-five were greatest for continuously uninsured adults with hypertension or diabetes, for whom reducing the risk of cardiovascular disease is particularly important. Because the receipt of preventive services was assessed only once before and once after age sixty-five, these estimates might have been biased if age trends in service use by insured and uninsured adults differed before age sixty-five. These findings might also overstate the effects of coverage on steady-state utilization if there were anticipatory delays in use among uninsured adults in the years immediately preceding their Medicare eligibility. For example, the age profiles constructed by Card, Dobkin, and Maestas (2004) and Decker (2005) for mammography suggested hints of this behavior among less educated and minority women aged sixty-two to sixty-four. Such transient dips in utilization just before age sixty-five could make increases after that age appear

more dramatic when data for earlier ages are not considered or are not available.

Meer and Rosen (2004) used self-employment status as an instrumental variable to estimate the effect of having health insurance on the use of preventive services. In these quasi-experimental analyses of data from the 1996 to 1998 waves of the Medical Expenditure Panel Survey (MEPS), they estimated that insurance coverage increased the receipt of recommended blood pressure checks, cholesterol testing, influenza vaccination, mammography, and Pap testing by twenty-three to fifty-two percentage points. Many of these instrumental variables estimates were larger than those from corresponding observational comparisons that had been adjusted for observed sociodemographic characteristics. The accuracy of these findings, however, relies on the validity of the assumption that self-employment is related to utilization only through its effect on health insurance status, which is not a testable assertion. Wage earners who became self-employed were similar at baseline to adults who remained wage earners in regard to their general health status and visits to physicians. Nevertheless, other unobserved characteristics, such as risk tolerance, health behaviors, or subsequent changes in health status, could have driven both self-employment decisions and the use of preventive services. The relative stresses or, conversely, the flexibility of self-employment also may have directly influenced utilization. Using a combination of difference-in-differences and instrumental variables techniques, Busch and Duchovny (2005) assessed the effects of state Medicaid eligibility expansions from 1995 to 2001 on Pap testing for previously uninsured mothers, estimating that 29 percent of those who had not been screened for cervical cancer were screened after becoming eligible.

General Health Care Utilization

Measures of general health care utilization provide less direct information about health status than do assessments of specific evidence-based preventive or therapeutic services. Hospitalizations and visits to physicians may or may not benefit health, depending on the effectiveness and safety of the care, and they may indicate either timely interventions or the consequences of delayed or deficient care. Recent quasi-experimental studies of the effects of health insurance status on utilization are nonetheless

instructive, for several reasons. First, because uninsured adults may choose not to purchase health insurance because they value or need health care less than insured adults do, it is important to establish a causal link between uninsurance and underutilization. Although widely accepted, this link has been based largely on observational comparisons, because the uninsured population in the United States differs substantially from the study population in the RAND Health Insurance Experiment. Second, to the extent that advances have improved the effectiveness of medical care since the RAND study (Cutler 2001; Cutler and McClellan 2001; Cutler, Rosen, and Vijan 2006), differences in overall utilization between insured and uninsured adults—with all else being equal—may be more suggestive of health outcomes than they were in the past. Third, because the health effects of health insurance presumably are mediated by the use of medical care, it is important to evaluate the consistency of coverage effects on outcomes and mediators, particularly among uninsured groups who are most likely to gain from greater use of health services, such as those with chronic conditions.

Three recent quasi-experimental analyses examined the effects of coverage on general health care utilization and contributed secondary but noteworthy findings to the principal evaluation of health effects. Using the same strategy employed in several analyses of preventive services, all three studies exploited the exogenous changes in insurance coverage occurring after age sixty-five due to nearly universal Medicare coverage. Using cross-sectional data from the 1973–1998 National Ambulatory Medical Care Surveys (NAMCS), Lichtenberg (2002) examined age profiles of annual per capita visits to physicians and found an abrupt and persistent increase in utilization after age sixty-five. A similar increase in hospital admissions was also observed in the same study in age profiles of data from the 1979–1992 National Hospital Discharge Surveys (NHDS), but most of this surge seemed to be due to anticipatory postponement in the two years preceding Medicare eligibility. In analyses of visits to doctors reported in the 1997–2003 NHIS and of hospital discharges from 1992 to 2002 in three states, Card, Dobkin, and Maestas (2004, 2008) disaggregated age profiles by sociodemographic predictors of coverage and more formally tested trends using a regression discontinuity framework. After age sixty-five, less educated adults and racial and ethnic minorities, groups who were more likely to be uninsured before age sixty-five, increased their use of routine visits to doctors more than other groups did. Hospital admissions also increased sharply

and persistently after age sixty-five, but racial and ethnic differences in these increases varied by admission diagnosis and primary procedure performed. For example, increases in admissions for joint replacement and coronary artery bypass graft surgery were greater among white adults than black adults, suggesting that the demand for relatively expensive elective procedures may be more sensitive to the increased generosity of coverage afforded by supplemental insurance, which is disproportionately purchased by white beneficiaries, than to changes in health insurance status from uninsured to insured. But because these data were cross-sectional, increases in these potentially beneficial procedures could not be compared by insurance status before age sixty-five within racial and ethnic groups.

In a longitudinal analysis of 1992 to 2004 data from the HRS, near-elderly adults who were intermittently or continuously uninsured before reaching Medicare eligibility at age sixty-five reported significantly greater increases in doctor visits, hospital admissions, and total medical expenditures after age sixty-five than did adults who had continuous private coverage before age sixty-five (McWilliams et al. 2007b). These differential increases were concentrated among adults with cardiovascular disease (hypertension, heart disease, or stroke) or diabetes, conditions for which there are many effective treatments to prevent costly complications. Moreover, previously uninsured Medicare beneficiaries with these conditions reported 13 percent more doctor visits, 20 percent more hospitalizations, and 51 percent more total medical expenditures than did previously insured beneficiaries who otherwise had similar observed characteristics at age fifty-nine to sixty and had comparable generosity of coverage after age sixty-five (i.e., supplemental insurance and prescription drug coverage). These persistently elevated health care needs suggest that uninsured near-elderly adults with manageable chronic conditions enter the Medicare program at age sixty-five with greater morbidity than they would if they had previously been insured. However, unlike quasi-experimental comparisons of utilization before and after age sixty-five, the comparison of utilization after this age by prior insurance status was strictly observational, and differences between previously insured and uninsured adults could have been explained by preexisting differences in unobserved predictors of health. In another longitudinal analysis of changes in insurance status, Ward and Franks (2007) used data on nonelderly adults aged twenty-one to sixty-four from the 2000 to 2003 MEPS and found that total medical expenditures were higher for

previously uninsured adults after they received insurance coverage but were not statistically different from total expenditures for continuously insured adults. The sample of uninsured adults who gained coverage was small ($n = 385$), however, and the changes in insurance status were voluntary and therefore could not be considered exogenous.

Together, these new contributions have consistently and robustly demonstrated the positive effects of health insurance coverage on the receipt of beneficial preventive services and use of health care more generally, thereby establishing important mediating links in the causal pathway from health insurance to health outcomes and suggesting a substantial potential for beneficial effects on health.

Review Findings: Health Outcomes

Recent research has assessed the effects of health insurance on a variety of health outcomes in both the general population of adults and groups with specific acute and chronic conditions.

Health Outcomes in the General Population

General Health and Physical Functioning. Several observational studies conducted before 2002 demonstrated strong associations between uninsurance and poorer self-reported general health status and physical functioning among adults in the United States (IOM 2002). These associations remained statistically significant after adjusting for observed differences between insured and uninsured adults, and they varied in strength with continuity of coverage and length of uninsured periods (Ayanian et al. 2000; Baker et al. 2001). Building on previous research using longitudinal data from the HRS, Baker and colleagues (2002) demonstrated that near-elderly adults who lost their insurance were subsequently 82 percent more likely than those who kept their private insurance to report a decline in overall health. Using more than twenty years of longitudinal data from the 1979 National Longitudinal Survey of Youth, Quesnel-Vallée (2004) found that self-reported general health was significantly worse among uninsured adults than among their siblings with private or public insurance. This comparison arguably controlled for unobserved baseline factors shared by siblings, such as common parental genetic influences. Although these dose-response

relationships, temporal consistencies, and more sophisticated adjustments for confounding factors suggest causal effects of uninsurance on health, definitive conclusions cannot be drawn from these observational findings.

Since 2002, several quasi-experimental studies have advanced our understanding of the effects of health insurance coverage on overall health and physical functioning. Many of these studies used similar analytic approaches, recognizing near-universal Medicare coverage after age sixty-five as a source of variation from previous insurance status that might enable causal effects on health to be estimated. Using cross-sectional data from the 1987 to 1991 NHIS, Lichtenberg (2002) found that the number of days that adults aged sixty-five or older spent in bed each year was 13 percent lower than expected, based on trends among younger adults. Although the distinct shift downward at ages sixty-five to sixty-nine in the profile of mean bed days pointed to an effect of Medicare coverage on morbidity, the analysis lacked comparison groups who were more and less likely to be insured before age sixty-five to distinguish the effects of receiving coverage from the effects of other events associated with aging, such as retirement. In a regression discontinuity analysis of cross-sectional data from the 1992 to 2001 NHIS, Card, Dobkin, and Maestas (2004) found statistically significant improvements in self-reported general health among sociodemographic groups who experienced the largest gains in insurance coverage at age sixty-five. Based on these differential shifts in level of general health, the gap between more educated white adults and less educated black and Hispanic adults was reduced by 12 percent after age sixty-five. Although this finding suggests only a modest, immediate effect of gaining coverage, the data also indicated a differential improvement in general health trends at age sixty-five for less educated black and Hispanic adults relative to trends for more educated white adults. A change in health trend might be expected, for example, if coverage improved access to more effective management of chronic conditions that prevented or postponed complications. Owing to substantial year-to-year variability in the cross-sectional age profiles, this break in trend was not formally estimated but may have represented additional benefits of coverage. In sensitivity analyses, Card, Dobkin, and Maestas (2004) found no evidence for discontinuities in employment status, marital status, geographic location, or family income that might otherwise explain the discontinuities in general health. But if other unobserved predictors of health also differentially changed

between comparison groups at age sixty-five, then the comparative gains in health among relatively disadvantaged groups may not have been due to Medicare coverage.

To address this limitation, Decker and Remler (2004) used Canada as an international control. They constructed profiles of the general health status of people aged fifty-five to seventy-four from NHIS data for U.S. adults and National Population Health Survey (NPHS) data for Canadian adults and compared them by income, country, and age (65 or older versus under 65) in a difference-in-differences-in-differences approach. Among the near-elderly, low-income adults in the United States were fifteen percentage points more likely than high-income adults to be in fair or poor health, compared with an eight-percentage-point difference between low- and high-income adults in Canada. Among adults age sixty-five or older, this seven-percentage-point international difference was reduced to three percentage points, meaning that near-universal Medicare coverage may have reduced the excess risk of fair or poor health among low-income adults by four percentage points or that uninsurance explained more than half of the health disparity between low-income and high-income nonelderly adults in the United States. These findings arguably add robustness to the health effects estimated by Card, Dobkin, and Maestas (2004) by addressing other potentially confounding life events coinciding with age sixty-five for both U.S. and Canadian adults. In a sensitivity analysis, however, income-related health disparities in the two countries rose and fell in tandem at other ages but to different degrees. Thus, the factors driving these fluctuations in disparities within countries may have also explained age-related changes in between-country differences in disparities. Furthermore, because NPHS data on age were limited to coarse five-year intervals, the age at which the health of U.S. elderly adults with low incomes improved could not be precisely defined. A differential discontinuity in the level and/or trend of health disparities occurring precisely at age sixty-five in the United States would have supported a more definitive attribution of the findings to universal coverage.

In these studies of cross-sectional data, the effects of Medicare coverage on other measures of health were not assessed, and uninsured adults, particularly those with specific conditions who might have benefited most from coverage, could not be longitudinally followed as they became eligible. Several subsequent studies used longitudinal data from the HRS to assess the effects of acquiring Medicare coverage on the

health of previously uninsured adults. Baker, Feinglass, and colleagues (2006) found that adults who had no insurance one to two years before turning sixty-five were more likely to report a major decline in general health or a new functional limitation in their first interview after age sixty-five. In subsequent interviews, after at least two years of Medicare eligibility, previously uninsured adults no longer reported significantly higher rates of these health declines. While these findings suggest a relative improvement in health trends for previously uninsured adults after they gained Medicare coverage, the numbers of observations before and after age sixty-five were limited; expected outcomes in the absence of Medicare coverage were not established based on preceding trends; and a quasi-experimental framework was not employed to formally test the effects of coverage gains.

Polsky and colleagues (2006) used more recent data from the HRS to follow participants longer after age sixty-five and compared trajectories in self-reported general health between insured and uninsured near-elderly adults before and after age-eligibility for Medicare. Health declines became less common after age sixty-five for previously uninsured adults, and the proportion of these adults reporting excellent or very good health after age sixty-five was 7.7 percentage points higher than expected based on their trajectory before age sixty-five. However, previously insured adults also reported a statistically significant improvement in their health trajectory after age sixty-five. This change in trajectory was slightly smaller, indicating a net positive health effect for previously uninsured adults attributable to Medicare coverage, but the differential effect was not statistically significant. No other measures of health were included in this analysis. Using the same data and a similar analytic strategy, McWilliams and colleagues (2007a) compared changes in health trends reported by previously insured and uninsured adults after age sixty-five for a more comprehensive set of six self-reported general, physical, and mental health measures and a summary measure of these component items. Compared with adults who were continuously insured, adults who were intermittently or continuously uninsured from age fifty-five to sixty-four reported significantly improved health trends after age sixty-five for the summary health measure and several component measures. Consistent with previous findings (Polsky et al. 2006), trends in general health (ranging from excellent to poor) did not differentially improve for the previously uninsured. But trends in the change in general health (ranging from much better to much worse) did

significantly improve for previously uninsured adults compared with previously insured adults. This finding suggested a slowing rate of decline after age sixty-five, to which the general health status scale may have been insensitive because of floor or ceiling effects. Analyses of agility and mobility scores also indicated that gaining Medicare coverage improved trends in physical functioning for previously uninsured adults. Both these studies addressed potential biases from differential mortality or attrition among previously uninsured adults after age sixty-five by using weighting techniques to adjust longitudinal analyses for nonresponse and by incorporating death into outcome measures as a permanently low state of health. In addition, adjusting for retirement and the receipt of Social Security benefits in sensitivity analyses did not substantially alter the principal findings of either study. Nevertheless, the estimated effects of coverage gains could be biased if unobserved life events or non-response due to unmeasured factors differed for previously uninsured adults starting at age sixty-five.

Two recent studies used data from the HRS and instrumental variables methods to estimate the effects of private health insurance on self-reported general health and physical functioning for near-elderly adults (Dor, Sudano, and Baker 2006; Hadley and Waidmann 2006). Both found statistically significant and substantial effects of private coverage on health relative to no coverage, and these quasi-experimental estimates were much larger than those obtained using standard multiple regression models. In a third study that used instrumental variables techniques, Pauly (2005) used data from the 1996 MEPS to assess the effects of health insurance coverage on medical costs, utilization, access to care, and general health status among nonpoor young women. Although estimates were not statistically significant for the health status outcome, instrumental variables estimates for the expenditure, utilization, and access to care measures were significant and larger in magnitude than the naïve regression estimates, further suggesting that earlier observational comparisons may have underestimated the effects of coverage. But the validity of an instrumental variable cannot be tested directly, and the instruments used by Hadley and Waidmann (2006; spouse's prior union status, immigrant status and years in the United States, and involuntary job loss), Dor, Sudano, and Baker (2006; state-level marginal tax rates, unemployment rates, and unionization rates), and Pauly (2005; firm size and marital status) all were plausibly related to health through mechanisms other than health insurance status (Kronick 2006; Levy

and Meltzer 2008). Notably, the effects of uninsurance estimated by Dor, Sudano, and Baker did not vary with the presence of chronic conditions that can be effectively managed. This finding is inconsistent with demonstrated heterogeneity in the benefits of medical care across levels of clinical risk and casts some doubt on the validity of the selected instruments. In contrast, using the same data, McWilliams and colleagues (2007a) found that the effects of acquiring Medicare coverage were almost entirely concentrated among previously uninsured adults with cardiovascular disease or diabetes. Nevertheless, it is notable that the results from these instrumental variables studies were consistent across a range of instruments.

Finally, all these recent quasi-experimental studies assessing the effects of insurance coverage on general health or physical functioning were limited because health outcomes were self-reported rather than clinically assessed.

Mortality. Before 2002, two observational studies provided evidence that uninsured adults die at younger ages than their privately insured counterparts (IOM 2002). Of these two, the analysis that adjusted for more demographic, socioeconomic, and health characteristics estimated that the risk of death over thirteen to seventeen years was 25 percent greater for adults who were uninsured at baseline than for adults who were privately insured (Franks, Clancy, and Gold 1993). Two subsequent analyses of HRS data estimated this increased risk to be 35 to 43 percent for uninsured near-elderly adults after controlling for even more predictors of mortality (Baker, Sudano, et al. 2006; McWilliams et al. 2004). The association between uninsurance at baseline and subsequently higher mortality risk was particularly strong among near-elderly adults who were white, had low incomes, or had diabetes, hypertension, or heart disease (McWilliams et al. 2004). A sensitivity analysis demonstrated that the explanatory effect of an unmeasured predictor would have to be greater than the impact of smoking on mortality differences between insured and uninsured adults for the increased risk among the uninsured to lose statistical significance. Thus, only major omissions in the predictive model would fully explain this strong association between coverage and mortality among the near-elderly. In addition, lacking health insurance was associated with major health declines but not an increased risk of death within two years, suggesting that premature death is likely to be a long-term rather than a short-term consequence of uninsurance in the general near-elderly population (Baker, Sudano, et al. 2006).

Because mortality generally represents a distal outcome for all but the severely or acutely ill, quasi-experimental analyses designed to identify abrupt discontinuities in rates or even linear trends may not be suitable for estimating the effects of health insurance on mortality in the general population. Using life tables produced by the Social Security Administration (SSA), Lichtenberg (2002) found a dramatic drop in the growth rate in annual probabilities of death for adults beginning at age sixty-five. In a later analysis of National Center for Health Statistics Multiple Cause of Death files, however, Card, Dobkin, and Maestas (2004) found no evidence of a deceleration in rising mortality rates at age sixty-five, and they cited several limitations of the SSA life table data that could have produced spurious results. Similar assessments of the introduction of Medicare in 1965 found no discernable impact on mortality for beneficiaries (Card, Dobkin, and Maestas 2004; Finkelstein and McKnight 2005), although many subsequent medical advances are likely to have improved the effectiveness of health care for elderly adults in the United States.

Because of the often delayed effects of health services on survival and the nonlinear relationship between mortality rates and increasing age, these null findings from quasi-experimental analyses of the effects of Medicare coverage should be interpreted with caution and are not necessarily inconsistent with findings from observational comparisons. As discussed later, quasi-experimental approaches such as regression discontinuity designs may be more suitable for assessing the effects of coverage on mortality among acutely ill adults for whom short-term reductions in the risk of death might be expected from greater access to appropriate care (Card, Dobkin, and Maestas 2007). Instrumental variables analyses of longitudinal data are less subject to these limitations, and Hadley and Waidmann (2006) estimated that universal coverage would lower the death rate before age sixty-five from 6.7 percent to 3.9 percent among near-elderly adults. However, as discussed earlier, the validity of these estimates requires that the selected instrumental variables exclusively predict exogenous differences in coverage.

Health Outcomes for Adults with Chronic Conditions

In addition to potentially life-saving procedures and therapies for acutely ill patients, medical care has become particularly effective in reducing

morbidity and mortality among adults with chronic conditions. These include cardiovascular diseases such as hypertension, coronary heart disease, congestive heart failure, peripheral arterial disease, and cerebrovascular disease, as well as diabetes, chronic kidney disease, certain cancers, and depression. Because the severity of these conditions may progress insidiously or asymptotically, health outcomes for chronically ill adults are particularly sensitive to timely preventive and diagnostic services and appropriate management and treatment.

Cardiovascular Disease and Diabetes. Findings from experimental and quasi-experimental studies before 2002 provided strong evidence that less extensive coverage or loss of coverage leads to worse blood pressure control among low-income adults with hypertension (Fihn and Wicher 1988; Keeler et al. 1985; Lurie et al. 1984). A recent observational analysis of data from the National Health and Nutrition Examination Survey (NHANES) found uninsured adults with treated hypertension had substantially lower adjusted rates of blood pressure control, suggesting that these early quasi-experimental findings may generalize to the current national population of uninsured adults with hypertension (Duru et al. 2007). In another analysis of NHANES data, Ayanian and colleagues (2003) found that uninsured adults were significantly more likely to have undiagnosed hypertension and hypercholesterolemia, and adjustments for measures of access to care explained much of these differences. Fowler-Brown and colleagues (2007) used data from the Atherosclerosis Risk in Communities Study to longitudinally assess cardiovascular outcomes among insured and uninsured adults aged forty-five to sixty-four in four U.S. communities from 1987 to 2000. Uninsured adults had higher adjusted risks of stroke, myocardial infarction, and death by 65 percent, 22 percent, and 26 percent, respectively, although the elevated risk of myocardial infarction was not statistically significant. Uninsured adults were also consistently more likely to be unaware of clinically determined hypertension, diabetes, and hypercholesterolemia, and those with hypertension were more likely to have inadequate blood pressure control. In an analysis of 2002 data from the Nationwide Inpatient Sample (NIS), Shen and Washington (2007) found uninsured patients hospitalized for acute ischemic stroke had higher levels of neurological impairment and a 24 percent higher mortality risk compared with privately insured patients; uninsured patients with intracerebral hemorrhage had a 56 percent higher mortality risk. Because there are few therapeutic interventions for acute stroke, particularly acute intracerebral

hemorrhage, these findings suggested that uninsured adults suffered more severe strokes because of poorer management of cardiovascular risk factors, such as hypertension and hypercholesterolemia, and fewer preventive carotid endarterectomies when indicated for asymptomatic or symptomatic carotid stenoses. Unobserved differences in disease severity or health behaviors also, however, could have explained these results.

As previously mentioned, a recent quasi-experimental analysis of longitudinal data found that differential improvements in self-reported health trends after age sixty-five were concentrated among previously uninsured adults with cardiovascular disease (hypertension, heart disease, or stroke) or diabetes (McWilliams et al. 2007a). Compared with previously insured adults with these conditions, adults who were intermittently or continuously uninsured reported significantly improved trends after age sixty-five for a summary measure of general, physical, and mental health and for component measures of mobility, agility, and change in general health. The effects of acquiring coverage were substantial, as the expected disparity in health scores between previously insured and uninsured adults with cardiovascular disease or diabetes was reduced by 50 percent by age seventy. Although these outcomes were not disease specific, self-reported physical functioning correlates strongly with clinical complications of cardiovascular disease such as angina, dyspnea, neuropathy, visual impairment, myocardial infarction, and stroke (Guralnik et al. 1993; McHorney, Ware, and Raczek 1993). In addition, previously uninsured adults also reported differentially improved trends in adverse cardiovascular outcomes, including myocardial infarctions, angina that limited activities, and hospitalization for congestive heart failure. Several secondary findings suggested potential mediators of these health gains. First, health trends were particularly improved for previously uninsured adults who acquired prescription drug coverage after age sixty-five. Second, in a cross-sectional analysis of hemoglobin A_{1c} levels in 2003 among adults with diabetes, glycemic control was significantly worse for uninsured adults than for insured adults under age sixty-five but was similar for previously insured and previously uninsured adults aged sixty-five or older. Third, consistent with the concomitant changes in health levels and health trends at age sixty-five indicated by analyses of cross-sectional data (Card, Dobkin, and Maestas 2004), the longitudinal age profile of mean summary health scores for HRS participants with cardiovascular disease or diabetes pointed to both immediate health improvements within three years of Medicare

eligibility and an attenuation in the slope of declining health for previously uninsured adults thereafter. Although the analysis lacked sufficient statistical power to discriminate among these effects, this consistent pattern suggests that simplified models of summary health measures may fail to capture complex clinical effects and consequently underestimate the full benefits of insurance coverage. Finally, differential increases in doctor visits and hospital admissions after age sixty-five were also concentrated among adults with cardiovascular disease or diabetes (McWilliams et al. 2007b). In concert with previous experimental, quasi-experimental, and observational studies, these findings suggest that health insurance coverage improves the health of previously uninsured adults with cardiovascular disease or diabetes, as improved access to care, greater use of effective procedures and medications, and better management of these conditions alleviate symptoms, maintain functioning, and prevent or postpone complications.

Cancer. A large body of observational research completed before 2002 demonstrated that uninsured adults with cancer are diagnosed at more advanced stages of disease, have poorer outcomes, and die sooner, even after adjusting for stage of disease (IOM 2002). These findings suggest deficits in screening and diagnostic services as well as in curative and palliative procedures and therapies for uninsured adults with prevalent cancers, including breast, cervical, colorectal, and prostate cancer and melanoma. Two recent observational studies used data from the U.S. National Cancer Database to generalize these associations to the national population, as most earlier studies of insurance coverage and cancer outcomes relied on state or regional cancer registries. Uninsured patients with cancers diagnosed between 1998 and 2004 were more likely than privately insured patients to be diagnosed at advanced stages of disease, particularly those with cancers that can be detected early by screening (e.g., breast or colorectal cancer) or by symptom assessment (e.g., melanoma or bladder cancer) (Halpern et al. 2008). In contrast, no significant differences in stage at diagnosis were found between insured and uninsured adults with cancers that typically become clinically apparent at late stages and for which there are no effective screening tests (e.g., ovarian or pancreatic cancer). After adjusting for cancer stage, five-year survival rates were significantly lower for uninsured adults than for privately insured adults diagnosed with breast or colorectal cancer, two prevalent cancers for which there are not only effective screening tests but also treatments demonstrated to influence survival (Ward et al. 2008).

Similar associations between insurance status and stage at diagnosis and between insurance status and survival also have been demonstrated for laryngeal and oropharyngeal cancer in other recent observational studies using these data (Chen and Halpern 2007; Chen et al. 2007a, 2007b).

Residual differences in cancer outcomes between insured and uninsured adults in these observational comparisons could have been explained by differences in unmeasured factors, such as socioeconomic conditions, comorbid conditions, treatment adherence unrelated to cost, health awareness, or demand for medical care. In particular, poorer cancer outcomes have also been consistently observed for adults with Medicaid coverage compared with those for adults with private insurance. Because many cancer patients with Medicaid coverage were uninsured upon presentation but gained coverage retroactive to their date of diagnosis, poorer outcomes among publicly insured adults may be partially due to earlier lack of insurance and more advanced stages of disease at diagnosis. However, in an analysis of Michigan state tumor registry data, eight-year survival rates were significantly lower for Medicaid-enrolled adults with breast, colorectal, or lung cancer, regardless of the timing of their enrollment, than for those who were otherwise insured (Bradley et al. 2005). Compared with privately insured patients, cancer patients with Medicaid coverage may be underinsured and receive poorer quality of care. Or their worse outcomes may be driven by the same unobserved factors that could explain differences in outcomes between privately insured and uninsured adults. For example, a disproportionately high rate of emergency colorectal cancer resections has been observed among uninsured adults with colorectal cancer, suggesting delays in diagnosis and treatment that may be related to less access to care (Diggs et al. 2007). Yet in a recent national study of adults with colorectal cancer admitted for surgery, uninsured and Medicaid patients had equally elevated risks of inpatient mortality, and these estimates were sensitive to adjustments for measured comorbid conditions (Kelz et al. 2004). Insurance status may therefore be a marker of other factors that cause worse outcomes but are not directly influenced by insurance coverage.

Few quasi-experimental studies have addressed the limitations of these observational studies in estimating the effects of insurance status on cancer outcomes. An analysis of Surveillance, Epidemiology, and End Results (SEER) data from 1980 to 1994 found that the probability of late detection of breast cancer was significantly lower after Medicare eligibility at age sixty-five for white women but not for black women (Decker

and Rapaport 2002). Among women diagnosed with early-stage disease, expanding coverage for near-elderly women was estimated to increase the five-year survival rate by one more percentage point for black women than for white women. Although these findings could mean Medicare coverage improves survival for black women with cancers that are detected early and amenable to treatment, this small differential increase in survival was not statistically significant. A subsequent analysis of SEER data through 2001 found a decrease of 3.4 percentage points after age sixty-five in the proportion of Hispanic women with breast cancer who were diagnosed with late-stage disease, compared with a 1.8 percentage point decrease among white women (Decker 2005). The differential decrease for Hispanic women also was not statistically significant. A survival analysis of these data found that Medicare coverage was associated with an 11 percent relative reduction in mortality risk for all women diagnosed with breast cancer, but this effect did not differ by race or ethnicity. Although these findings indicate negligible effects of insurance status, the lack of longitudinal data on health insurance status before age sixty-five significantly limits inferences from comparisons of outcomes before and after Medicare eligibility. Using sociodemographic proxies, like race and ethnicity, for coverage introduces tremendous measurement error into analyses, because most white, black, and Hispanic adults have health insurance before age sixty-five, and a significant fraction of white adults (the control group) also gains coverage through Medicare after age sixty-five. The effects of coverage may be further muted by documented racial and ethnic disparities in care among insured adults. Therefore, the small relative benefits observed for black and Hispanic women with breast cancer after age sixty-five may signify larger underlying effects of Medicare coverage on previously uninsured women.

Depression. Uninsured adults with depression and other mental illnesses are less likely to receive appropriate care (IOM 2002), but no recent observational or quasi-experimental studies of the effects of uninsurance have focused primarily on mental health outcomes. In one analysis, previously uninsured adults without cardiovascular disease or diabetes reported significantly improved trends in depressive symptoms after age sixty-five relative to those of previously insured adults (McWilliams et al. 2007a). Although this finding suggests distinctive mental health benefits of coverage for uninsured near-elderly adults without certain medical conditions, the effects of coverage on depressive symptoms for adults with depression remain unclear.

Health Outcomes for Adults with Acute Conditions

Many observational studies have demonstrated that uninsured adults who are hospitalized or present to the emergency room, particularly for acute cardiovascular conditions, traumatic injuries, or other emergency conditions, receive less care and are more likely to die than are insured adults (IOM 2002). Most of these analyses, however, were inherently plagued by selection bias, as the availability of patient data was contingent on interactions with providers. For example, if insured adults are more likely to seek care for less serious conditions that tend to prompt more discretionary or unnecessary admissions, and if these presentations cannot be distinguished from more severe conditions by coarse diagnostic codes, then hospital-based samples of uninsured adults might exhibit disproportionately worse but not necessarily inequitable health outcomes. Alternatively, uninsured adults may postpone presentation until they suffer preventable complications, so that observed differences in inpatient outcomes between insured and uninsured adults reflect differences in disease severity on admission and not differences in hospital care. Such delays may result from a lack of insurance coverage but may also be due to other characteristics, beliefs, or preferences that drive both care-seeking behaviors and the demand for insurance.

An analysis of medical records for adults presenting with acute asthma exacerbations to emergency departments at fifty-seven academic medical centers found that uninsured adults had received poorer quality of ambulatory care for their asthma before their presentation, had more severe asthma at presentation, but were not more likely to experience relapses, readmissions, or ongoing exacerbations afterward (Ferris et al. 2002). But because inclusion in the study and several of the outcomes depended on the manner in which care was sought, the findings could not support conclusions about the effects of uninsurance on outcomes in the general population of adults with asthma.

Two recent observational studies attempted to address these selection concerns and control for differences in care-seeking behaviors by assessing health outcomes following health shocks that are plausibly unrelated to insurance status and uniformly prompt medical care. Hadley (2007) assessed self-reported medical care and general health status following unintentional injuries or newly diagnosed chronic conditions among insured and uninsured adults using data from the 1997 to 2004 MEPS.

After these events, uninsured adults were significantly more likely to obtain no medical care at all, received fewer services if they did, and were more likely to report subsequent declines in health status and lack of full recovery. This observational comparison could not control for unmeasured factors that could have caused relatively worse injuries, more advanced chronic disease at diagnosis, or subsequently poorer health among uninsured adults. The use of nationally representative survey data solved the selection problem often encountered in analyses of hospital data, because outcomes were observed for both those who did and did not seek medical care. Even though lower rates of accessing care suggested uninsurance caused delays even when care was critical, this finding also underscores the magnitude of health perturbations required for a health-shocks sampling strategy to address differences in care-seeking behaviors effectively when representative data are not available.

In a Wisconsin study of trauma care and mortality among insured and uninsured adults who suffered unexpected health shocks, Doyle (2005) ensured that all subjects received care by focusing on severe automobile accidents in which injured drivers were unable to participate in their initial treatment decisions. This strategy successfully addressed differences in care-seeking behaviors between insured and uninsured adults that might otherwise have biased the estimated effects of insurance status on outcomes in an acute setting. After adjusting for observed driver, accident, vehicle, injury, neighborhood, and hospital characteristics, uninsured crash victims received 20 percent less care, particularly costly procedures and services, than did privately insured patients, and had a substantially higher mortality rate: 1.5 percentage points above the mean rate of 3.8 percent. Since the subjects constituted, at best, random samples of the state's insured and uninsured populations, these observational comparisons still were subject to confounding by unobserved differences between these groups. Sensitivity analyses tested the robustness of the results to several sources of potential bias. For example, insured patients were limited to those who did not have automobile insurance to better balance risk-taking behaviors, income, and vehicle type between comparison groups. The results also remained the same when uninsured accident victims were compared with those covered by Medicaid to adjust for potential unmeasured differences in health and socioeconomic characteristics between insured and uninsured patients. Thus, findings from this thorough observational analysis present a

convincing argument that lack of insurance leads to inadequate care and worse outcomes for trauma victims.

Since 2002, three quasi-experimental studies have more rigorously assessed the effects of insurance coverage on the mortality of adults with a variety of acute conditions. Volpp and colleagues (2003) studied mortality rates for insured and uninsured patients who were hospitalized for acute myocardial infarction (AMI) in New Jersey both before and after state market reforms in 1994 lowered payments to hospitals for uncompensated care and changed the hospital payment system to price competition from cost-based reimbursement. These reforms cut subsidies for the care of uninsured patients both directly and indirectly, as competitive pressures restricted hospitals' ability to shift the costs of uncompensated care onto payers of care for insured patients.

Based on difference-in-differences analyses of New Jersey hospital discharge data, in which discharge data from New York and the NIS were used to control for secular trends, no significant changes in AMI mortality were detected for insured patients in New Jersey relative to those in New York or in the nation. In contrast, annual mortality rates for uninsured patients in New Jersey rose after the reform, by 3.7 to 5.2 percentage points compared with those for uninsured patients in New York. Concurrent relative decreases in rates of cardiac procedures also were observed for these uninsured patients. These findings provide strong evidence that a lack of insurance coverage exposes uninsured patients with AMI to poorer quality of care and higher mortality risks when providers are reimbursed less for uncompensated care or are unable to use profits from insured patients to cover the costs. In a similarly designed analysis of discharge data in these two states, Volpp and colleagues (2005) also found relative increases in mortality for uninsured New Jersey patients admitted for congestive heart failure and stroke when compared with New York patients. Mortality trends between 1990 and 1996 were similar in New Jersey and New York for hospitalized patients with hip fracture, gastrointestinal bleeding, pulmonary embolism, or pneumonia, regardless of their insurance status.

In another quasi-experimental study of state discharge data, Card, Dobkin, and Maestas (2007) examined the effects of near-universal Medicare coverage after age sixty-five on mortality among acutely ill patients in California who were hospitalized between 1992 and 2002. To avoid a differential selection of a nonrepresentative sample of uninsured adults under age sixty-five, the analysis was restricted to a set of "nondeferrable"

conditions, including AMI, stroke, respiratory failure, chronic obstructive pulmonary disease or asthma exacerbation, hip fracture, and seizure. Admission rates for these diagnoses were demonstrated to be the same on weekdays and weekends and to trend smoothly through age sixty-five, with no discontinuities to suggest that previously uninsured adults with these conditions alter their care-seeking behaviors after gaining Medicare coverage, apart from possibly reducing delays. A regression discontinuity analysis of mortality rates by age identified an abrupt decrease of one percentage point in seven-day mortality at age sixty-five, indicating a 20 percent relative reduction in the overall death rate for these acutely ill patients due to Medicare coverage. The mortality effect persisted for at least two years after admission, suggesting a lasting impact from the greater use of beneficial procedures and medications. The decline in mortality was too large to be explained by changes in cross-sectional rates of uninsurance from age sixty-four to sixty-five, meaning that near-elderly adults who have limited public or private coverage may also benefit from Medicare coverage.

Discussion

Many new research contributions have advanced our understanding of the health consequences of uninsurance among adults in the United States. These studies have found consistently positive and often significant effects of health insurance on health across a range of outcomes (see table 1), thereby bolstering the general conclusions of the Institute of Medicine's 2002 report. Several new insights also have emerged from these recent findings. Namely, health insurance coverage seems to matter most to the aging and the sick. Benefits of coverage have been demonstrated most conclusively for adults with acute or chronic illnesses that are amenable to medical care, and older adults are at greater risk of developing many of these conditions. Building on earlier research examining the health effects of coverage *losses* in local populations, several recent national studies assessing the effects of near-universal Medicare coverage after age sixty-five suggest that uninsured near-elderly adults who are acutely or chronically ill would substantially benefit from *gaining* coverage. In addition, recent research has focused on validated health outcomes rather than markers of access to care, allowing more direct characterizations of the health consequences of uninsurance. In particular,

new observational and quasi-experimental analyses provide stronger evidence of an especially increased mortality risk for older uninsured adults with acute or chronic conditions.

These substantive advancements can be largely attributed to the greater use of more rigorous methods, which has significantly improved the quality of research on this topic since 2002. Whereas only four studies in the three decades before 2002 were considered experimental or quasi-experimental (IOM 2002; Levy and Meltzer 2004), fourteen studies in the last seven years have used quasi-experimental approaches to estimate the effects of health insurance on health outcomes more robustly (see table 2). Among the research contributions that I reviewed, more than half the principal findings were the product of quasi-experimental rather than observational analyses. Although these recent quasi-experimental studies have made important research contributions to a largely observational body of research, they remain subject to significant limitations (table 2). Without random assignment of insurance status, estimated effects cannot be characterized as causal with absolute certainty. Given the low likelihood of future randomized trials, future studies may strengthen inferences by evaluating recent state initiatives, such as the sweeping legislation to achieve near-universal coverage in Massachusetts or the use of a lottery to randomize public insurance benefits to eligible adults during a budget shortfall in Oregon.

Nevertheless, these important strides in research quality have strengthened the evidence that uninsurance adversely affects health, thereby allowing conclusions to be more definitive. Significant health benefits of health insurance coverage have now been robustly demonstrated for adults across a range of chronic and acute conditions, including hypertension, coronary heart disease, congestive heart failure, cerebrovascular disease, diabetes, HIV infection, depressive symptoms, acute myocardial infarction, acute respiratory conditions, and other acute conditions. In addition, strong observational research points to substantial health benefits of coverage for adults with traumatic injuries and treatable cancers, although few quasi-experimental studies have been conducted to corroborate these findings. The concentration of benefits in these groups is consistent with clinical rationales that health insurance should have the greatest effect on those patients who stand to benefit most from health care. Indeed, owing to many major medical advances since the RAND Health Insurance Experiment, medical care is arguably now most effective for these very conditions.

The effects of health insurance on general health and mortality in the general population have been consistently shown in quasi-experimental analyses to be more modest. Given the variable effectiveness of medical care across clinical conditions and risk categories, and the large proportion of insured and uninsured adults who are young or healthy, the lack of discernable immediate effects of coverage in these studies is not unexpected. For example, several studies have demonstrated robustly that health insurance coverage increases the use of important screening and preventive services, but the receipt of these services may not pay dividends in mortality or quality of life for years or even decades. Because delayed effects of interventions are particularly hard to detect with commonly used quasi-experimental approaches, these findings are not necessarily inconsistent with prospective observational comparisons that have found substantial long-term survival gains for adults who were insured at baseline. Diluted health effects of insurance coverage in the general population may have also resulted from overutilization of potentially harmful services and greater exposure to medical errors among adults who had greater coverage and therefore received more care. Why such offsetting effects might be disproportionately larger for healthier populations that receive fewer services and less intensive treatment is unclear. Moreover, the greater use of inappropriate care among adults with more extensive coverage (Newhouse 1993) reflects deficiencies in coverage design and the delivery system, not in insurance status *per se*, and so should be addressed accordingly. Thus, efforts to improve patients' safety and quality of care may uncover additional benefits of coverage.

These themes emerging from a growing body of research have important policy implications. Based on increasingly strong evidence, policies that achieve universal coverage would likely improve health outcomes for many uninsured adults in the United States. Several mechanisms may produce these health benefits, as studies indicate that expanding insurance coverage would affect both patients' and providers' behaviors. Newly insured adults' greater demand for health care may lead to more timely initiation of care, greater use of effective services, or better adherence to recommended treatments. Expanded coverage may also benefit uninsured adults who already have regular access to safety-net care if coverage gains allow them to seek care from providers who provide better quality of care, or if increased reimbursement allows provider organizations with fewer resources to invest in quality improvement. In

addition, more consistent reimbursement may allow providers to offer effective but costly procedures and treatments at more equitable rates for a given mix of patients. No study has effectively parsed the relative importance of these mechanisms, perhaps because these changes in patients' and providers' behaviors are difficult to measure or differentiate, as they ultimately have similar effects on the amount and appropriateness of care delivered. Nevertheless, several studies have suggested prominent effects of patients' coverage on providers' behaviors (Doyle 2005; Volpp et al. 2003, 2005), whereas combinations of these mechanisms could have explained findings from other studies.

These mechanisms are important to consider in predicting the net benefit of universal coverage for the entire U.S. adult population from research findings, as the magnitude and distribution of health benefits will hinge on the devilish details of any reform. For example, health insurance coverage is multidimensional, and its effects on health extend beyond those measurable in crude comparisons of health insurance status. Although I did not review research on the effects of cost sharing on the health of insured persons, this literature suggests that the benefits of universal coverage may be reduced if changes in insurance status are coupled with increases in cost sharing for important services. Indeed, considering the benefit structure of the types of health insurance examined in many quasi-experimental studies (e.g., private group health insurance or Medicare coverage with supplemental insurance), extension of relatively generous coverage to the uninsured may be required for the health benefits estimated in these studies to be fully realized. Similarly, uninsurance rates may be lowered while leaving deficiencies in provider networks, reimbursement, and delivery systems for newly insured patients. Thus, efforts to expand coverage may be less effective in improving population outcomes if divorced from concomitant efforts to optimize cost sharing, incentives to providers, and the quality of care delivered by all providers.

Rather than universal coverage, a reasonable argument could also be made for incremental reforms targeting particular groups of uninsured adults, such as the near-elderly or those with chronic conditions, since these adults are likely to benefit most. Such limited expansions are likely to be problematic and less effective, however, for several reasons. From a practical standpoint, it would be difficult to accurately and equitably enumerate clinical eligibility criteria to capture all adults who would benefit from expanded public coverage or to selectively target

these adults when expanding private coverage. Furthermore, universal coverage may lead to smaller but distinctive health benefits for healthier groups of uninsured adults, but these effects have not been sufficiently evaluated, as pointed out earlier. A comprehensive list of covered conditions and services could be compiled that included chronic disease care, preventive care, and acute care services, but such exhaustive targeting would essentially constitute a standard benefits package and extend coverage for effective services to all adults: a universal, not an incremental, approach.

Moreover, better health is only one benefit of health insurance. For example, Medicare coverage reduces the risk of extremely high out-of-pocket medical expenditures for previously uninsured beneficiaries (Finkelstein and McKnight 2005; McWilliams et al. 2007b). Indeed, the demand for health insurance is largely driven by a desire to reduce financial risk in the event of acute or chronic illness, to transfer wealth between healthy and potentially sick states in life, and to pay the expected now in order to insure against the unexpected later. Since lifetime health care needs vary greatly among individuals, risk must be shared in order for an insurance system to meet this demand. Without mechanisms to pool risk with healthier groups, the burden of financing incremental expansions for uninsured adults with particular chronic conditions would fall on the chronically ill, thereby defeating this major purpose of health insurance. Thus, in the absence of entitlements or mandates typical of broader reforms, targeted incremental expansions would likely be plagued by inadequate subsidies and risk pooling, adverse selection, and prohibitively expensive premiums for prospective beneficiaries. In addition to the greater health benefits and spread of risk achieved by universal coverage, greater equity may be derived from requiring healthy uninsured adults who can afford health insurance to purchase it or contribute to its purchase by others. Finally, greater reductions in the numbers of uninsured adults may have positive spillover effects on the quality of care delivered to neighboring insured adults (Pagán et al. 2008; Pauly and Pagán 2007; Schootman et al. 2007).

Although the benefits of expanding health insurance coverage might be greater for certain subgroups of uninsured adults, policies that achieve universal coverage would likely be needed for these benefits to be realized. Nevertheless, the heterogeneity in the effects of uninsurance on health is noteworthy, as it directly reflects the tremendous variability in the effectiveness of medical care delivered to insured adults. Thus, while

the research findings summarized here provide a strong rationale for extending coverage to all uninsured adults in order to improve outcomes for many, these findings also suggest great value in considering the relative effectiveness of services in coverage and delivery decisions once all adults are insured. In other words, observations that coverage matters more to some than others should not necessarily influence decisions about insurance status, or who to cover, but they could inform debates about how to design insurance, what to cover, how much to cover, and for whom to cover specific services. For example, the deleterious effects of uninsurance concentrated among adults with cardiovascular disease and diabetes may be best addressed by reforms that achieve universal coverage rather than incremental expansions, but coverage may be better designed if selectively more generous for adults with these conditions or for disease-specific services of proven effectiveness.

In conclusion, based on the evidence to date, the health consequences of uninsurance are real, vary in magnitude in a clinically consistent manner, strengthen the argument for universal coverage in the United States, and underscore the importance of evidence-based determinations in providing health care to a diverse population of adults.

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*Denotes new contribution since 2002 and selected for systematic review; see table 1.

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